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INDUSTRIAL INVENTION PATENT

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Diving fin with channels narrowing in the forward direction in order to produce a propulsion effect

This invention refers to diving fins worn on the feet and is aimed at producing a fin of this type that, with the same working surface, provides greater efficiency than previously known fins by increasing the swimmer's forward thrust.

To this end, the fin of this invention has at least one channel on one or both faces that gradually narrows all the way to the tip of the fin.

In this way, and therefore while swimming, the forward extremity of the fin is directed notoriously rearward with respect to the direction of motion, the fluid threads that run along the surface of the fin and are channeled by the surface channel or channels of the fin undergo, due to the effect of the gradual decrease in the opening of this channel or channels, a noticeable increase in speed. This increase in speed of the fluid threads results in a reaction in the opposite direction, that is, forward in the direction of the movement, giving the swimmer a greater forward push or additional thrust than that obtained with the usual movement of the fins in the water.

This inventive principle can be achieved in a great variety of ways. For example, there may be one or more tapered channels on the same face of the fin and they may be placed on one or both faces of the fin. In the case of several channels with a narrowing cross section on the same face of the fin, the channels may be parallel, or converge toward or diverge away from each other. Furthermore, the narrowing channel or channels may cover the

entire surface of the fin or just a portion of it.

In terms of construction, the channel or channels on the fin may be formed by suitable ribs or little wings. The same fin may be provided with channels of narrowing cross section and channels with an enlarging or constant cross section. For example, one can provide channels running essentially in the longitudinal direction in relation to the fin, or at a slight angle in relation to the lengthwise direction of the fin, having at the start or rear portion a constant or widening cross section and then progressively narrowing toward the tip of the fin.

The fin according to this invention can be made of plastic material, rubber, or any other appropriate rigid, semi-rigid, or elastic material of any color, either buoyant or not. The boot of the fin may be a strap type, a clasp type, a sandal type, or any suitable type.

The narrowing of the channel or channels on the fin toward the forward tip of the fin can be accompanied by a similar narrowing of the working surface of the fin toward the forward tip of the fin, at least corresponding to the forward part of the fin. Such a fin shape that narrows toward the tip makes it easier to walk outside the water on account of it being less cumbersome and less apt to hit obstacles. This narrowing of the shape toward the extremity of the fin need not necessarily be accompanied by a reduction in the total working surface of the fin compared to known fins, although any reduction would be offset by the propulsion effect obtained with the narrowing channel or channels pursuant to this invention. Lastly, it has been found that a simple narrowing of the blade of the fin toward the tip, at least on the extremity of the fin, provides noticeable benefits compared to fins with blades widening toward the tip, even when the fin does not have longitudinal channels narrowing toward the tip.

These and other features of the invention, and the resulting benefits, will become evident from the following description of some embodiments illustrated as non-limiting examples in the appended drawings, in which:

Figures 1 and 2 illustrate a side view and top view of the first embodiment of the fin according to this invention.

Figure 3 is a cross section along line III-III of Figure 2.

Figures 4 and 8 illustrate top views of five other embodiments of the fin according to this invention.

Figures 4a, 4b, and 5a, 8a are cross sections along lines IVa-IVa, IVb-IVb, and Va-Va up to VIIa-VIIa of Figures 4 and 8, respectively.

The fin illustrated in Figures 1 to 3 includes blade 1 extending outward from boot 2 and having a shape viewed from above that, starting from the boot portion, first widens in the direction toward the fin's tip approximately up to point A, and then gradually narrows all the way to the tip of the fin. Blade 1 of the fin is equipped with edge ribs 3 on both edges that extend beyond both faces of the fin.

In this way a channel is formed on the upper surface of the

fin between the two side ribs, items 3, leading to the tip of the fin and having in the longitudinal direction an initially widening cross section up to point A, and then gradually narrowing to a noticeable degree as seen in Figure 2.

Consequently, the fluid threads running along the surface of the fin in the longitudinal direction from the heel to the tip when swimming are guided through the above-mentioned channel between edge ribs 3 and experience an increase in speed in the narrowing end section of the channel. This increase in speed, caused by the gradual decrease in the cross section of the channel along the fin, causes a reaction in the opposite direction (rearward on the fin and therefore forward in the swimming direction), thus giving the swimmer significant additional thrust. On the under surface of the fin blade 1 is provided with center longitudinal rib 4 that starts at the tip of boot 2 and extends forward only over a portion of the length of blade 1, forming, together with edge ribs 3, two converging channels flowing into one that gradually narrows all the way to the tip of the fin. Consequently, a propulsion effect similar to that described above is obtained on the lower surface as well.

Similar propulsion effects are obtained according to the invention with all the embodiments given in Figures 4 through 8.

In Figure 4, blade 1 of the fin starts on the side at approximately the middle of boot 2 and surrounds the tip portion of the boot with two side wings 101, which form a single blade, item 1, that gradually narrows toward the tip. On the edge, blade 1, 101 of the fin is provided with ribs 3, whereas a partial longitudinal rib 4 is provided in the center on both faces of blade 1 (Figures 4a and 4b). The end result is that two converging channels flowing into a single one are formed on both faces of fin 1, 101, with their cross sections gradually narrowing all the way to the tip of the fin.

In the embodiment of Figures 5 and 5a the working surface of the fin consists of two diverging wings, item 201, that extend away from boot 2. Wings 201 gradually decrease in width toward the tips and are provided with ribs 3 on one or both faces so as to form channels gradually narrowing all the way to the tip of the fin.

The embodiment of Figures 6 and 6a is essentially the same as that of Figures 5 and 5a, except that the two diverging wings, items 201, forming the blade of the fin and having ribs 3 forming the channels gradually narrowing toward the tip, are connected together by web 301 that increases the working surface. This fin takes on the shape of a normal fin widening toward the tip, regardless of the channels formed by ribs 3.

The embodiment of Figures 7 and 7a consists of a fin with normal blade 401, that is, widening toward the tip; however, on it are formed channels 5, 105, and 205 with a cross section gradually narrowing all the way to the tip of the fin, thanks to ribs 3. Channels 5, 105, and 205 can be provided on one or both faces of the fin and preferably converge toward the tip. The rear end of

channels 5, 105, and 205 can be open to allow fluid threads to enter, that is, the edge ribs may be lacking at the rear end at least on one face of the fin, or the ribs may be formed in any suitable fashion to provide a rear opening to the channels.

Lastly, Figures 8 and 8a illustrate a fin whose blade 501 essentially starts at the tip of boot 2 and then first widens and then gradually narrows. This fin, item 501, is also provided with ribs 3 on the edges, thereby forming a single channel that initially widens and then narrows gradually all the way to the tip of the fin.

Naturally, the invention is not limited to the embodiments just described and illustrated, but may be altered and modified significantly, especially with regard to the shape of the fins, the boot, and the number and configuration of the gradually narrowing channels provided on the blade of the fin. As already mentioned in the introduction, the invention also pertains to a fin without surface channels, or with channels having a cross section that essentially remains constant or widens toward the tip, but with a shape narrowing toward the tip, at least in the end section. Such a fin shape alone provides a series of significant benefits compared to shapes known thus far. And this without abandoning the information principle discussed earlier and claimed below.

#### CLAIMS

1. A swimming fin worn on the foot having, on one or both faces, at least one essentially longitudinal channel that narrows all the way to the tip of the fin so as to increase the speed of the fluid threads channeled through them and therefore cause a propulsion effect.

2. A swimming fin worn on the foot according to claim 1, wherein the fin narrows gradually toward the tip, at least in the forward portion.

3. A fin according to claim 2, wherein its blade is provided with edge ribs extending beyond one or both faces and forming one or more channels with a cross section gradually narrowing toward the tip.

4. A fin according to the foregoing claims, wherein the blade starting from the boot initially widens toward the tip and then gradually narrows with convex, straight, or concave sides.

5. A fin according to the foregoing claims having a center longitudinal rib that, with the edge ribs, forms two converging channels that converge together into a single channel gradually narrowing toward the tip.

6. A fin according to claims 1 to 3, wherein the blade portion consists of two diverging blades with a width gradually decreasing toward the tip and possibly equipped with edge ribs on one or both faces.

7. A fin according to claim 1 whose blade widens gradually toward the tip but which is equipped with ribs on one or both

faces forming parallel, converging, or diverging longitudinal channels, although with a cross section narrowing toward the tip, at least in the extremity section, with said channels going all the way to the tip of the fin.

8. A fin according to the foregoing claims wherein the channels gradually narrowing toward the tip are open at both the forward and rear ends.

9. A swimming fin with a blade narrowing toward the tip, at least in its outer portion, and/or with channels gradually narrowing toward the tip of the fin in order to provide a propulsion effect, substantially as described and illustrated in whole or in part, and for the described purposes.

Enclosure: 2 sheets of drawings

Price: 200 Lire